

Digital Elevation Model of False Pass, Alaska: Procedures, Data Sources, and Analysis

Prepared for the National Tsunami Hazard Mitigation Program (NTHMP) by the NOAA National Centers for Environmental Information (NCEI)

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Summary

In July of 2016, NOAA’s National Centers for Environmental Information (NCEI) developed an integrated bathymetric–topographic digital elevation model (DEM) of False Pass, Alaska for the National Tsunami Hazard Mitigation Program (NTHMP) and University of Alaska, Fairbanks (UAF). The 8/15 arc-second DEM will be used to support modeling tsunami generation, propagation, and inundation. The DEM covers Isanotski Strait between the western end of the Alaskan Peninsula and Unimak Island and the community of False Pass. The extents of these DEM, procedures, data sources, and analysis are described below. The methodologies used by NCEI in developing DEMs are described in the NGDC Technical Report of Kodiak, Alaska (Carignan et al., 2013).

DEM Specifications

The False Pass DEM were built to the specifications listed in Table 1. Figure 1 shows the previously developed 8/15 arc-second False Pass DEM boundary in green and the 8/15 arc-second DEM boundaries in red.

Table 1. Specifications for the 8/15 arc-second False Pass, Alaska DEM.

Grid Area	False Pass, Alaska
Coverage Area	163.25° to 163.47° W, 54.78° to 54.90° N
Coordinate System	Geographic decimal degrees
Horizontal Datum	World Geodetic System 1984 (WGS 84)
Vertical Datum	Mean Higher High Water (MHHW)
Vertical Units	Meters
Cell Size	8/15 arc-second
Grid Format	ASCII raster grid

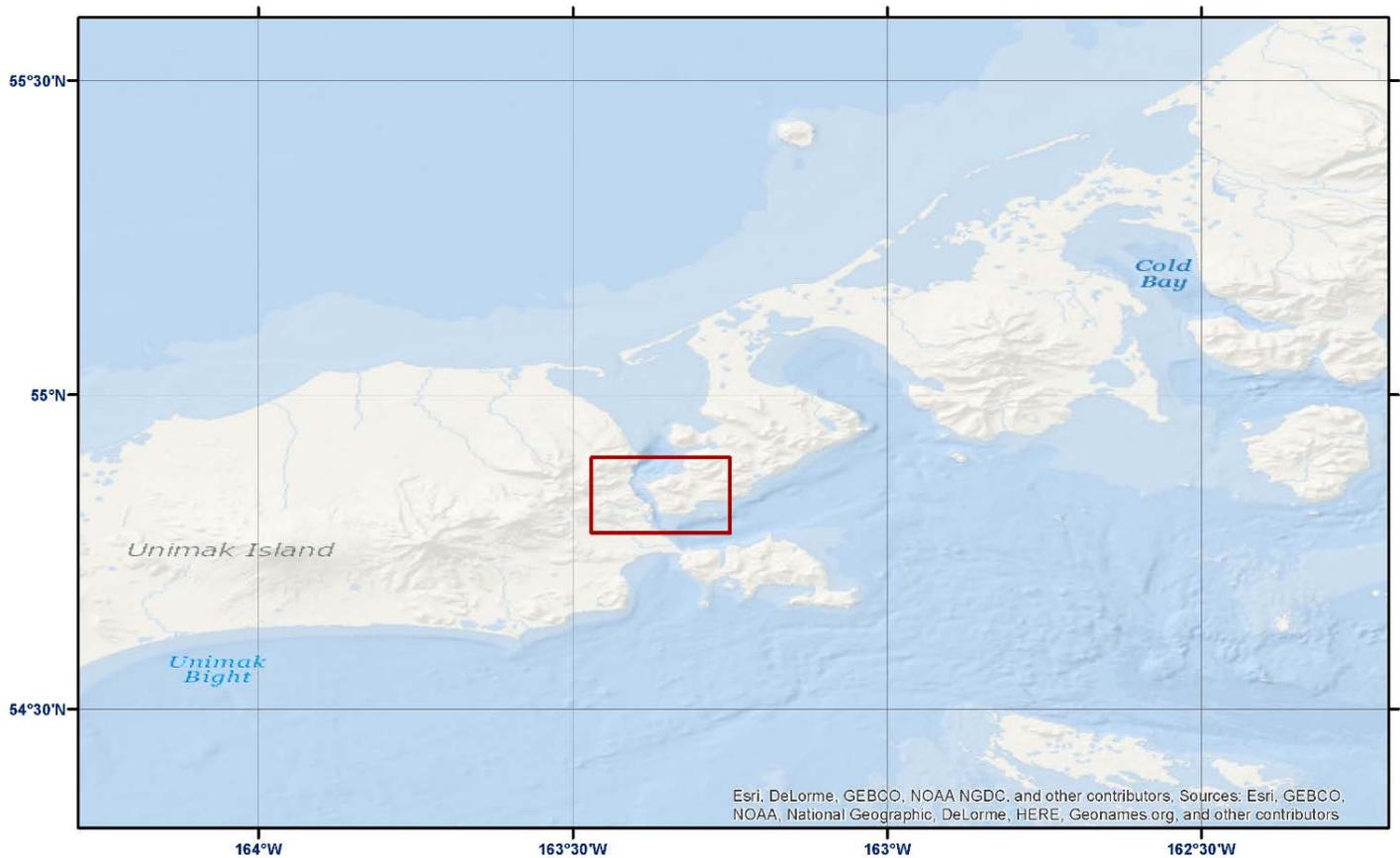


Figure 1. Map image of the boundary for the 8/15 arc-second False Pass DEM in red.

Data Sources and Processing

Data for the DEM were provided by UAF, the Alaska Department of Commerce, Community, and Economic Development Division of Community and Regional Affairs (DCRA), the U.S. Army Corps of Engineers Alaska District (USACE), USGS/NASA, and NOAA. Figure 2 shows the source and data coverage for the False Pass DEM.

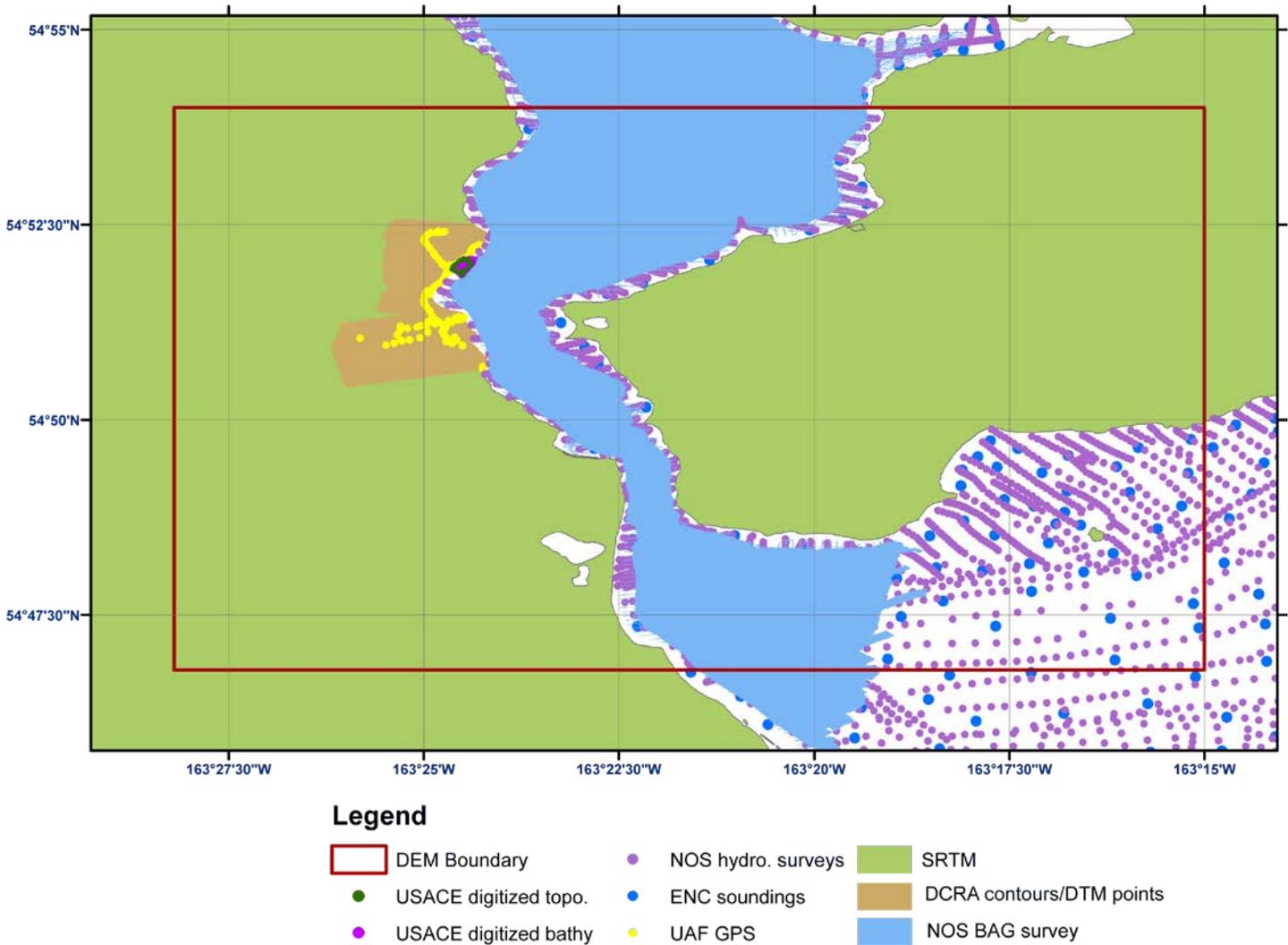


Figure 2. Source and coverage of the datasets used in compiling the False Pass DEM.

Table 2 lists the bathymetric data source used in the False Pass DEM. Table 3 lists the NOS surveys used in the surface that are located within the new DEM boundaries. The NOS hydrographic survey data were extracted from NEXT, NCEI Data Extract System (<http://www.ngdc.noaa.gov/next-web/cart.html>). The NOS BAG survey, H12632, was downloaded in BAG format separately to retain the full resolution. ENC chart soundings were extracted using NOAA's ENC Direct to GIS (http://encdirect.noaa.gov/ENC_Direct/encdirect_download.html). The USACE Alaska District hydrographic condition survey for False Pass Harbor was downloaded in PDF format, georeferenced, and soundings were hand digitized. Bathymetric data were transformed to WGS 84 and MHHW as needed using NOAA tide station #9462955 conversion value (Table 4) and where recent, higher resolution data exists, older data were deleted. A bathymetric pre-surface grid at 8/15 arc-second was generated using all the bathymetry data and an xyz file of the coastline set to zero elevation. The surface was clipped to the coastline before using as an input in the final grid.

Table 2: Bathymetric data sources used in compiling the False Pass DEM.

<i>Source</i>	<i>Date</i>	<i>Data Type</i>	<i>Spatial Resolution</i>	<i>Horizontal Datum</i>	<i>Vertical Datum</i>
NOAA NOS	1924 to 2014	Hydrographic survey soundings	1 meter to several kilometers	Unknown, Early Alaska Datums, or NAD 83 UTM Zone 3	Mean Lower Low Water (MLLW)
NOAA OCS	2000	Extracted chart soundings	20 meters to hundreds of meters	WGS 84 geographic	MLLW
USACE	2013	Project survey map digitized bathymetric survey points	~4 meter point spacing	NAD 83 AK (CORS96) State Plane Zone 5 (feet)	MLLW

Table 3: NOS hydrographic surveys

<i>Survey ID</i>	<i>Date</i>	<i>Scale</i>	<i>Original Horizontal Datum</i>	<i>Original Vertical Datum</i>
H04391	1924	10,000	Unknown	Mean Lower Low Water
H04394	1924	20,000	Unknown	Mean Lower Low Water
H04498	1925	20,000	Unknown	Mean Lower Low Water
H04499	1925	20,000	Unknown	Mean Lower Low Water
H04500	1925	20,000	Unknown	Mean Lower Low Water
H06146	1936	20,000	Early Alaska Datums	Mean Lower Low Water
H07993	1952	500,000	Early Alaska Datums	Mean Lower Low Water
H08373	1957	20,000	Early Alaska Datums	Mean Lower Low Water
H12632 (BAG)	2014	40,000	North American Datum 1983 UTM Zone 3 North	Mean Lower Low Water

Table 4: Relationship between MHHW and other vertical datums in the False Pass region.

<i>Vertical Datum</i>	<i>False Pass</i>	<i>Neumans Cove</i>	<i>Isanotski Strait Entrance, Iktan Bay</i>
	#9462955	#9462948	#9462961
MHHW	1.267	1.309	2.010
MHW	1.177	1.233	1.808
MSL	0.745	0.787	1.097
MTL	0.72	0.794	1.111
MLW	0.263	0.354	0.414
MLLW	0	0	0

Topographic data used in developing the False Pass DEM are listed in Table 5. UAF provided the DCRA topographic data in CAD format and a DTM text file. The topographic contours lines were extracted and transformed to point format using the vertices. These point data were gridded to minimize any terracing artifacts before converting back to point format for final gridding process. The USACE survey topographic points also

provided additional elevation information for False Pass Harbor. The SRTM 1 second DEM provided elevation data for all the area outside of the DCRA data boundary. Conversions to MHHW were done using values based on the tide station information.

Table 5: Topographic data sources used in compiling the False Pass DEM.

<i>Source</i>	<i>Date</i>	<i>Data Type</i>	<i>Spatial Resolution</i>	<i>Horizontal Datum</i>	<i>Vertical Datum</i>
SRTM	2001	Topographic DEM	1 arc second	WGS 84 geographic	WGS84/EGM96 Geoid
UAF		GPS points		WGS 84 geographic	MHHW
DCRA	2002	Extracted CAD contours and DTM points	2 foot contour interval	NAD 83 AK State Plane Zone 7 FIPS 5007 (feet)	NAVD 88
USACE	2013	Project survey map digitized topographic survey points	~25 feet point spacing	NAD 83 AK State Plane Zone 7 (feet)	MLLW

DEM Development

Development of the False Pass DEM followed procedures documented in NGDC Technical Report of Kodiak, Alaska (Carignan et al., 2013). Gridding weight was modified to Table 6.

Table 6: Data hierarchy used to assign gridding weight in MB-System.

<i>Dataset</i>	<i>Relative Gridding Weight</i>
NOS BAG survey	1000
USACE digitized topographic points	1000
UAF GPS	1000
USACE digitized bathymetric points	1000
DCRA topographic contours and DTM points	100
Bathymetric pre-surface	10
NOS hydrographic surveys	1
Extracted ENC approach and harbor soundings	1
SRTM	1
Coastline	1

DEM Analysis

The completed 8/15 arc-second False Pass DEM were compared to nautical charts, topographic maps, and high resolution imagery. Inconsistencies were evaluated and resolved based on most reliable data available.

Acknowledgement

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Reference

Carignan, K.S., S.J. McLean, B.W. Eakins, M.R. Love, and M. Sutherland (2013) Digital Elevation Model of Kodiak, Alaska: Procedures, Data Sources and Analysis, NGDC Technical Report, pp. 7.

Alaska Division of Geological & Geophysical Surveys, Alaska Tidal Datum

Portal. <http://dggs.alaska.gov/sections/engineering/ak-tidal-datum-portal/calculator.php> [accessed July. 2016].